UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

MEMORANDUM:

To: Olga Odiott

From: Jacquelyn Marchese, Entomologist

Through: Kevin Sweeney, Senior Entomologist

Date: 02/11/2015

Subject: PRODUCT PERFORMANCE DATA EVALUATION RECORD

DP barcode: 418518
Decision no.: 484273
Submission no: 948049
Action code: R180
Product Name: BES0668 Insecticide
EPA Reg. No or File Symbol: 432-RLGU
Formulation Type: Ultra Low-Volume aerosol
Ingredients statement from the label with PC codes included: 2% Deltamethrin 097805
Application rate(s) of product and each active ingredient (lbs. or gallons/1000 square feet or per acre as appropriate; and g/m^2 or mg/cm^2 as appropriate): Product Application Rate: Wide area and space spray application: not to exceed 0.036 lbs of AI per acre per year per site; ULV Non-thermal aerosol (cold fog): not to exceed 0.0014 pounds of AI per acre per 24 hours; Portable, backpack or hand carried ULV applications: 5 ounces of diluted product while walking 870 feet; Fly and mosquito control in indoor/outdoor livestock and poultry facilities: dilute in water 1:1 before application.

Product application rate for sand fly control by the U.S. Department of Defense: 0.0018 lbs deltamethrin/acre (approximately 2 g/hectare).

I. Action Requested: Review the submitted study to determine the product's efficacy against species of sand flies found in Europe.

II. Background: Investigate the efficacy of Aqua-K-Othrine, a water-based formulation of deltamethrin, via ground application, against several European sand fly species. Aqua-K-Othrine is registered in Europe and has the same amount of AI as the proposed product.

III. MRID Summary: 49280801 Chaskopoulou, A. 2014. Efficacy of Ground Ultra-Low Volume Applications with a Novel Water-based Formulation of an Unsynergized Pyrethroid against Phlebotomine Sand Flies. Project Number M/476971/01/01, US0404. Unpublished study prepared by USDA-ARS European Biological Control Laboratory.
(1) *GLP or non-GLP?* Non-GLP
(2) *State the purpose and briefly summarize the methods and results.*

Purpose: To test the efficacy of the subject product against sand flies under field-use conditions. This label includes a use for the U.S. Military at overseas locations where sand flies are a biting nuisance and disease vector threat to U.S. Forces.

Materials and Methods:

Study location: The study was located in Greece due to the availability of target sand flies in this location. The study director resides there and is an USDA-ARS employee assigned to the European Biological Control Laboratory in Thessaloniki, Greece. Three field sites, each at a different location (to separate the treatments) were selected based on being characterized as having high sand fly activity (having between 1,500 and 18,000 sand flies/trap/night). The size and exact locations of these sites was not stated in the report. However, they were characterized as kennel locations.

Test species: Phlebotomine sand flies. Three species were collected in the study area: *Phlebotomus perfiliewi, P. tobbi,* and *P. simici.*

Test substance: Aqua-K-Othrine, which is the water-based emulsion formulation sold in Europe with the same level of deltamerthrin (2%) (20g/L) as the pending product. The recommended European application rate is 25-50mL/ha. One liter of product treats 20-40 hectares. Dilution rate was 1:9.

Application rates: The active ingredient treatment rates were 1g and 2g per hectare. There were three treatments: 1) a high rate application of 100 ml/ha (3.38 fl oz/ha); 2); a low rate application of 50 ml/ha (1.69 fl. oz/ha) and 3) a control with 0 ml product/ha. I converted these values to lbs. of deltamethrin/acre and fl. oz. of product/acre as shown below.

Conversion to oz./acre:
1 hectare = 2.4711 acres
1ml = 0.338 fl. oz.
1fl. oz. = 29.57 ml
1000 ml of product contains 20g of deltamethrin
50 ml of product contains 1g of deltamethrin.

Therefore, the application rates per acre was:

Low rate = 1g deltamethrin/ha divided by 2.4711 = 0.4g deltamethrin/acre
0.4g/453.6g/lb = 0.0008 lbs deltamethrin/acre, which is less than one-half of the label rate of

0.0018 lbs deltamethrin/acre for sand fly control.

High rate = 2g deltamethrin per hectare = 0.8 g deltamethrin per acre
0.8g/453.6g/lb. = 0.0017 lbs deltamethrin/acre, which is slightly less than the label rate of 0.0018 lbs deltamethrin/acre for sand fly control

Low rate application volume per acre = 50 ml/2.4711 = 20.23 ml/acre.
20.23 ml/29.57/ml per fl. oz. = 0.68 fl. oz. product per acre.
High rate application volume is twice the low rate = 1.36 fl. oz./acre

Experimental design: (Based on the submitted study and the explanation below from the study director)
Treatments were made to wild sand fly populations. There were three treatments (control, low rate, and high rate). Each treatment was located at a different site. Five trials were conducted with the high dose and four trials conducted with the low dose. For the initial three trials one trap was placed in the middle of the spray plot. However, for trials 4 and 5 two more CDC light traps were added (location not described) for a total of three (In the Table 2 below the trials are refered to as "Low Dose 4-1, 4-2, 4-3, etc."). Each treatment was applied with a truck mounted ground ULV sprayer. During treatment, 11 monitors were set up within the treated area to characterize the droplet spectrum and confirm coverage of the treatment area. The Volume Median Diameter and droplet density and quantity were determined.
Clarifications on the experimental design and results were requested from BES. The study director provided the following response together with a data table that can be found below.

From Anda (Alex) Chaskopoulou to Kurt Vandock at BES. Transmitted to EPA by Jan Brill of BES on January 26, 2015.

"I am attaching an Excel file with the actual numbers of sand flies caught per CDC trap before and after the spray trials. There was total 5 trials conducted with the high dose and 4 trials conducted with the low dose. For the initial 3 trials we used one trap in the middle of the spray plot. However, for trials 4 and 5 we added two more CDC light traps - so 3 in total (that is why in the excel you will see Low Dose 4-1, 4-2, 4-3 etc). We added the additional traps in an attempt to portray the data in a different way. I would suggest for analysis to portray the population difference by looking at the total number of flies caught in the 3 traps before and after. Also the control site is a different site than the 2 treatment sites - this site has never received any kind of treatments. Initialy we were using control traps at the edges of our spray trials but we soon realized that these traps are affected by our treatment (either droplets moved into the "control" area or sand flies were migrating away from our treatment into the control area probably due to repellency...this is just a hypothesis). Keep in mind that during August-Sep is when the rate of adult emergence is maximum. What this means is that our trials were conducted right as the field populations were increasing in numbers.

The 2 most critical factors affecting the efficacy of ULV is a) timing of spraying and b) weather. The spray should occur during maximum target insect activity as you very correctly stated. P. perfiliewi which is the dominant species in these trials has a narrow window of peak activity and

more precisely the larger percentage of the population is active for about 1-2 hrs early in the evening. We performed dial periodicity trials in 2011 and we were able to identify this window of activity during August-Sep. So all trias were performed during that window. If we are targeting a different species with a different activity profile we will need to re-evaluate the timing of the application. Our trials were also conducted during low wind, high humidity circumstances. What this means is that our dense cloud of droplets remained within our treatment sites for at least 30 min after completion of application - and because of the high humidity and low wind sand fly activity was high (as expected). So, we tried to do the best we can to increase the likelihood that the insecticide actually reaches the target insects.

We will continue to perform trials in the following years so as the data set grows I will keep updating you. Also since it is very important to register AKO via EPA if there is a specific protocol they would like us to use i will be more than happy to adapt the experimental design to facilitate in the registration process. Let me know."

Sand fly population measurement: CDC Light Traps baited with dry ice were set up 24 hours pre-and post-treatment to determine the percent change in the sand fly population resulting from treatment. The mean percentage value was calculated for each treatment.

Data analysis: one-way ANOVA (JMP 2011) was conducted to analyze the mean percentage population change data from treatments using high and low application rates (four replications per rate) following an arcsine square root transformation of the percentage values.

Results:

Seventy percent of the sand flies collected in the traps were *Phlebotomus perfiliewi.*

Table 1. Population change of wild sand fly populations exposed to ground adulticiding treatments with a deltamethrin water-based product (Aqua-k-Othrine) in Thessaloniki, Greece

Treatment	Product Application Rate ml/ha (fl. oz./acre)(lbs deltamethrin/acre)	n	% Mean Population Change[a] ± Std Error [b]
AKO High Rate 2g deltamethrin/ha	100.0 (1.36) (0.0017)	4	-77 ± 15 a
AKO Low Rate 1g deltamethrin/ha	50.0 (0.68)(0.0008)	4	-30 ± 13 b
CONTROL	0.0 (0.00)(0.00)	4	+25 ± 11 c

[a] Population change was determined with comparison between numbers of pre-and post-treatment adult sand flies trapped in CDC traps placed within experimental sites and deployed

24 hrs. before and after each spraying trial. The population change is indicated by (-) or (+) sign in front of the mean for population decrease or increase, respectively.

[b] Means within a column followed by the same letter are not significantly different (P = 0.05)

Only the high rate resulted in a substantial treatment effect but the standard error indicates a considerable amount of variability in the data. This variability was exaggerated by the natural fluctuations in the wild sand fly population as evidenced by the control values.

Table 2. Number of sand flies captured in each trap for each treatment.

Treatment	# Sand flies 24hrs before*	# Sand flies 24hrs After*
Control 1	1530	2907
Control 2	5420	7588
Control 3	4230	3934
Control 4	3670	4510
Control 4	120	383
Control 4	640	380
Control 5	8095	9930
Control 5	1200	1000
Control 5	60	90
Low dose 1	2600	2030
Low dose 2	8350	5750
Low dose 3	2700	1756
Low dose 4	902	583
Low dose 4	150	100
Low dose 4	67	78
High dose 1	6850	411
High dose 2	3430	1200
High dose 3	380	107
High dose 4	1800	360
High dose 4	430	84
High dose 4	90	85
High dose 5	670	330
High dose 5	200	10
High dose 5	20	40

* trapping technique CDC miniature light trap baited with dry ice

(3) *State conclusions as they relate to study results following your review of the primary efficacy review and the study materials.*

The difference in percent control of each treatment was statistically significant with a p value of 0.05. Despite the statistical significance, the levels were less than the 95% level currently accepted by the Agency to satisfy the product performance requirement for wide-area ULV

adulticides (see OPPTS Test Guideline 810.3400). The percent change in the wild populations as shown in the control treatment, indicates natural daily fluctuations in the resident sand fly population.

(4) *Is the study acceptable or not? For studies that are not acceptable, state why.*
This study is **not acceptable** in supporting sand fly claims with a 2% deltamethrin product for the following reasons:
a. The percent difference from the control was less than 95%. The high rate showed 77% efficacy but control values fluctuated by 25% (see Table 1 above).
b. It is unclear how the treatments within a site were replicated without pseudoreplication. How big was each site? Were separate areas of the site treated?
c. The number of replicates for each treatment differed (4 vs 5) and there was a different number of traps between some of the replicates in the same treatment (see Table 2 above). In addition, untreated control traps were initially stationed on the edge of the plot and then moved to another location that was not described. It is unclear how these conditions were handled in the analysis of the data.
d. Additional information on the experimental design, methods, and data analysis is needed to fully evaluate the results of the study.

IV. ENTOMOLOGIST'S RECOMMENDATIONS:

1. Remove sand flies and biting midges from the label.

2. Remove the following section from the label:

"United States Department of Defense use for control of Sand Flies.

BES0668 INSECTICIDE may be applied by United States military personal or applicators under direct U.S. military supervision for control of sand flies by ground ULV application.

APPLICATION RATE: For effective control, apply this product diluted or undiluted at a rate of 0.0018 pounds of active ingredient per acre (equals 2 grams per hectare). Do not exceed 0.036 pounds of AI per acre per year to any site for this use. During any 14 day period do not apply more than 0.0018 lb a.i./A per site. Do not make more than 20 applications per site per year to control sand flies.

GROUND APPLICATION INSTRUCTIONS: Adjust spray equipment so that the volume median diameter is less than 30 Microns and that 90% of the spray consists of droplets smaller than 50 microns

USE RESTRICTIONS FOR WIDE AREA SAND FLY USE: Do not allow spray treatment to contaminate cropland, poultry ranges, or water supplies. Do not use on crops used for food or forage."